Appendix

1. Argentina

1.1 Telecommunications Regulation

1.1.1 Regulation

The National Communications Commission (CNC) was created in 1997 in order to police spectrum and telecommunications use and to ensure compliance with current contractual obligations. The regulatory functions for the telecommunications sector were formerly carried out by the National Telecommunications Commission (CNT).

In January 1997, the Government issued Decree 92/97, which changed the tariff structure for local and long distance calls and initiated calling party pays legislation. The objective in changing wireline service tariffs was to end the subsidization of local service by higher long distance rates. In order to accomplish this goal, the pulse rate was adjusted for certain calls and the pulse price was increased. Local services are now charged according to three categories for pulse prices: peak, normal and night/weekends, which have pulse rates of one pulse per every 90 seconds, 120 seconds, and 240 seconds, respectively. Long distance has 12 different tariff categories based on call distance with an increasing number of pulses assessed as domestic call distance increases. Under the new tariff plan, the price for a pulse has increased to $0.044. In terms of per minute use for local calls, the increase in pricing represents a more than 35 percent increase in peak time costs and a 58 percent increase in night and weekend costs.

The decree also addressed the monthly service fees for residential (for private homes), commercial (for businesses), and professional (for not-for profit or government) subscriptions. Monthly billing rates in the interior have been assessed differently from those in Buenos Aires, however the new plan treats subscribers in different areas equally. The average fee increase under the new tariff regime is 52 percent for residential service (now US$12.50 per month), 11 percent for commercial service, and 57 percent for professional organizations. Under the new rate plans, no free pulses are included, whereas the former plan included 100 free pulses per month for residential subscriptions. For the first time, all subscribers, whether they are residential, business, or professional, will be charged the same price for connecting to the PSTN in basic tariff areas of US$250.

The decree also started calling party pays in April 1997. Mobile subscribers do not pay for the airtime of inbound calls from the fixed telephone network within Argentina. Non digital lines, however, do not transmit billing information and therefore the airtime costs are charged to the mobile subscriber. Calls from outside the country also continue to use the mobile subscriber pays format.

The January decree also included a new Reglamento General de Interconexion (RGI), marking an important advance towards creating transparent interconnection and promoting competition. From a new carrier's perspective, the previous framework was vague. Among the

more onerous restrictions under the former regime was the requirement that all inter-Local Mobile Calling Areas (LMCAs) and mobile-fixed calls interconnect at the closest point to the call origin and transit over the PSTN to its destination.

The new RGI makes several changes that favor wireless operators. These include:

- Use of long-term marginal cost as a basis for developing pricing
- Mutual or reciprocal compensation (facilitated by CPP)
- Clearer definition of dominant and non-dominant negotiating positions providing pricing on an á la carte basis for local access
- Switching facilities and transmission facilities
- Permission for the non-dominant carrier to elect the point of interconnection and access to co-location.

Table 1.1 presents recent government activity, including recent decrees outlining competition in local and long distance.

Table 1.1 Regulatory Time Line: Argentina, 1990 - 1997

November 1990	Argentine government privatized 60 percent of the previously state-owned Empresa Nacional de Telecomunicaciones (Entel), the primary provider of telecommunications services in Argentina.
	*Northern portion was granted to Telecom Argentina and the southern portion granted to Telefónica de Argentina.
December 1996	A government reform program created a new regulatory structure for Argentine telecommunications.
	New entity called the Bureau of Legal Affairs was created to advise the Secretariat on legal issues impacting policy options.
	Undersecretariat of Communications, once part of the Ministry of Economics and Public Works, was transformed into an independent government entity titled Secretariat for Communications. Responsible for:
	*Communications policy.
	*Developing regulatory norms to be enforced by a separate regulatory agency
	*Approving new telecommunications licensing procedures
	*Approving spectrum planning
	*Proposing tariff policies for areas under regulatory control
	*Reprepresenting Argentina at international forums

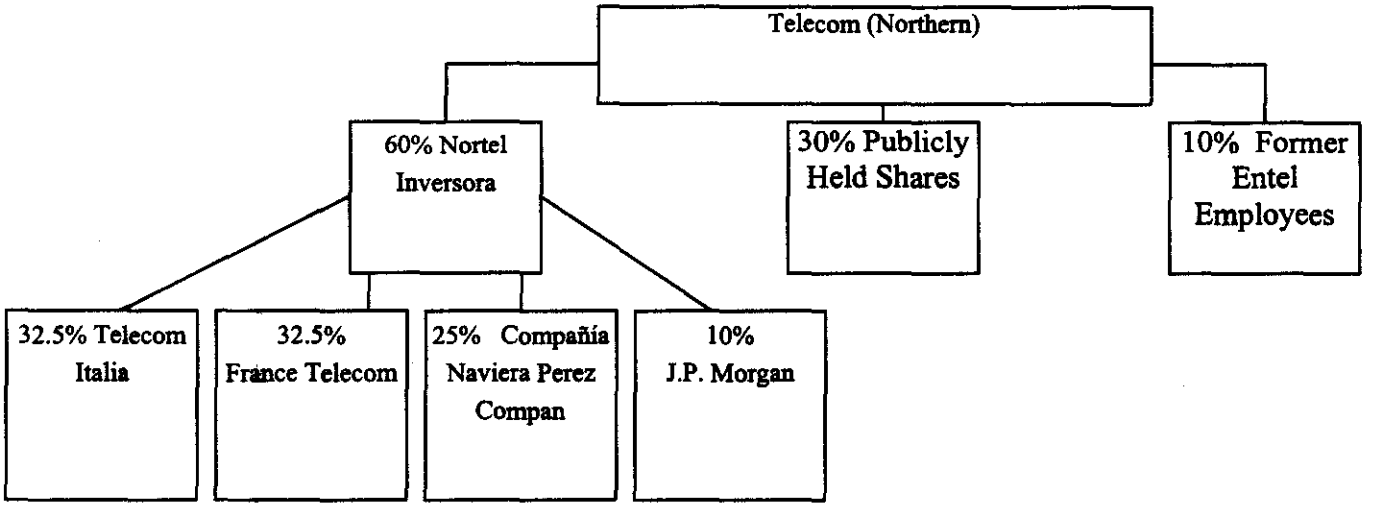
Table 1.1 Regulatory Time Line: Argentina, 1997 – 2000

Early 1997	The regulatory functions for the telecommunications sector, formerly carried out by the National Telecommunications Commission (CNT), were merged with the postal regulatory body to create the new National Communications Commission (CNC).
	Among the most important objectives of the new CNC are to police spectrum and telecommunications use to ensure compliance with current contractual obligations and legal precedence, and to prevent and sanction anti-competitive behavior.
January 27, 1997	Government issued Decree 92/97 which included tariff rebalancing, the PCS licensing structure, calling party pays (CPP) and reformed interconnection issues.
	*Reglamento General de Interconexion (RGI) was part of this decree, marking an important advance towards creating transparent interconnection and promoting competition.
May 13, 1997	Government announced an invitation to bid for two 1900 Mhz licenses in Region II to be awarded in October 1997.
	Each license will allow 30 MHz of spectrum in 1.85 to 1.99 GHz. Of the remaining 40 MHz, 20 MHz each will be awarded to the two incumbent cellular operators 16 months after the first bid award.
March-98	President Menem issued Decree 264/98 which outlined deregulation of local telephone service as well as domestic and international long distance
	*Telecom and Telefónica will be allowed to provide basic local telephony service, as defined in the original privatization law, outside of their respective regions at the national level.
	*The two companies were no longer able to jointly own companies between them (e.g. Miniphone, Telintar and Startel).
May 1999	Two 1900 Mhz licenses in Region II awarded.
June 1999	1900 MHz licenses awarded in Region I and III.
November-99	According to decree 264/98, two additional operators to be licensed to compete in the local services market with Telecom and Telefonica
February 2000	Rural telephone concessions will be auctioned.
November 2000	According to decree 264/98, three new operators will be allowed to enter long distance market.

Source: The Strategis Group

In November 1990, the Argentine government privatized 60 percent of the previously state-owned Empresa Nacional de Telecomunicaciones (Entel), the primary provider of telecommunications services in Argentina. The Northern portion was granted to Telecom Argentina and the southern portion was granted to Telefónica de Argentina.

The split of Entel led to the following ownership structure:



The 60% stake for the southern region was sold to Telefónica de Argentina, consisting of a consortium of Telefónica de España, Citibank, and Techint (an Argentine construction firm). In February 1997, Cointel, an Argentina-based holding company, in conjunction with Citibank and Telefónica Internacional, became majority shareholders of Telefónica de Argentina, owning 55.9 percent. On November 19, 1998, Citicorp announced plans to sell up to 18 million ordinary class B shares in Telefónica de Argentina or up to 1.8 million in Telefonica ADRs before December 15.

Telecom and Telefónica jointly own and operate Telintar (Argentina International Service Company), the monopoly provider of international long distance, telex, and value-added services. Startel, also owned by Telecom and Telefónica, provides a variety of services, including packet-switched data and telex. In addition to the two major operators, there are over 300 independent and cooperative telephone companies, the largest of which are Compañía Argentina de Teléfonos (CAT), Santiago del Estero, and the Provincial Telephone Administration of Entre Rios. The average size of many of the independents is 200 access lines, however numerous switches support upwards of several thousand subscribers.

1.1.2 Telephony Infrastructure

Prior to the privatization of the landline telephone network in 1990, the quality and penetration of basic telephony service was extremely low. Through September 1996, Telecom and Telefónica invested approximately US$9.5 billion to modernize the telephone network. As a result of this investment, total lines in service penetration have increased from approximately 12 to over 16 per 100 population. Digitization of the network has also improved. At year-end 1998, an estimated 90 percent of the PSTN had been digitized. The majority of the analog switching capacity remaining in Argentina falls within Telefónica's (soutern region) operating area.

Telephony penetration varies by region by the fact that approximately half the telephone lines in Argentina are installed in Multiple Area of Buenos Aires (Area Múltiple de Buenos Aires—AMBA). The AMBA penetration rate is 25.6 percent, nearly double that of the rest of the country. In general, Telefónica has a higher penetration rate than Telecom, with 21 lines in service per 100 of the population, while Telecom is just below 15 lines per 100 inhabitants of its service area.

1.2 Cellular Market Licensing Issues

1.2.1 800 MHz Licensing

Argentina is divided into three cellular regions, with two cellular license holders in each region. Region I is in the northern half of the country, Region II is the extended AMBA area, and Region III is located in the south. The largest region, in terms of population, is Region I with 40 percent of Argentina's population. Region II has 38 percent of the population and Region III has 22 percent of the population. By far, the most densely population region is Region II, which serves the extended Multiple Area of Buenos Aires.

The Argentine government was the first South American government to issue a cellular license to a private entity when in July 1988, the government granted the first cellular license to Compañía de Radiocomunicaciones Móviles (CRM), operating under the commercial name Movicom in Region II. Over the following eight years, other consortiums were awarded licenses and began operations in Argentina (**Table 1.2**).

Table 1.2 Ownership of Cellular Licenses in Argentina

Region	Band	Operator	Trade Name	Ownership
Region I	Band A	Compañía de Comunicaciones Personales del Interior (CCPI)	Personal	Telecom de Argentina 100%
	Band B	CTI del Norte	CTI	GTE 23%, Compañía Austral de Inversión 20%, Lucent Technologies 10%, TCW Americas 5%, TAICO and Telefone S.A. 42%
Region II	Band A	Miniphone S.A.	Miniphone	Telefonica de Argentina 50% Telecom Argentina 50%
	Band B	Compañía de Radiocomunicaciones Moviles (CRM)	Movicom	BellSouth 60%, Motorola 14%, Socma and BGH 26%
Region III	Band A	Telecomunicaciones Celulares Personales (TCP)	Unifón	Telefonica de Argentina 100%
	Band B	CTI Sur	CTI	GTE 23%, Compañía Austral de Inversión 20%, Lucent Technologies 10%, TCW Americas 5%, TAICO and Telefone S.A. 42%

Source: The Strategis Group

1.2.2 1800/ 1900 MHz Licensing

On May 13, 1997, the Argentine government announced an invitation to bid for two 1900 MHz licenses in Region II originally to be awarded in October 1997. Each license allows 30 MHz of spectrum in 1.85 to 1.99 GHz. Of the remaining 40 MHz, 20 MHz each has to be awarded to the two incumbent cellular operators 16 months after the first bid award, contingent upon compensation to the government by the current operators for the spectrum, which must be allocated in a manner consistent with the winning bids. The government expects to raise US$300 million with the tender of two licenses in Buenos Aires and Grand Buenos Aires. As the 1800/1900 MHz license holders will eventually be permitted to compete with fixed services, Telecom and Telefonica's decision to extend their monopoly over basic telephone services will dictate that license winners will first offer mobile services. No later than November 2000, PCS license holders can initiate fixed wireless offerings.

1800/ 1900 MHz licensing has been delayed several times since the initial proposal for bids. The process was first stopped in October 1997, when Telefonica de Argentina filed a court injunction, complaining that its exclusion from the sale was discrimination. In March 1998, the government attempted to resolve the judicial problems that delayed the auction due to Telefonica's objection by allowing Télefonica or Telecom to participate in the auction process if one of the providers sells its interest in Miniphone to the other provider. Legislation does not allow any single operator to hold more than one license. The government also decided to modify the General Interconnection Rules and allow for the participation of CTI in the auction process. In April 1998, Telesystem International Wireless (TIW) of Canada filed a court injunction to halt the PCS licensing process. Telesystem objects to language in the bidding documents that permits UTE (a joint venture of Unifón and Telecom Personal) and CTI to make a second offer if they fail to present winning bids.

A federal judge rejected TIW's complaint and on November 17, 1998, the Secretary of Telecommunications announced that it would award the two licenses on December 18. TIW appealed the latest verdict and license awarded have been pushed in 1999. Argentine authorities have received the technical qualification bids for two licenses to provide PCS services in the Buenos Aires metropolitan region. The bidding is set to begin April 23rd. The government will sell a further three PCS licenses to operate nationwide (excluding AMBA) in late 1999. The Communications Ministry suspended the sale of two licenses after Canada's Telesystem International Wireless filed a last minute injunction against the auction. The ministry received five technical bids without opening the envelopes as planned.

The five bids came from the following companies and consortia:

1) Unifon-Personal – a joint venture formed by Telefonica and Telecom's mobile operators;
2) US-based AirTouch with Argentine conglomerate Techint;
3) Hong Kong's Hutchison Telecommunications International Group;
4) US-based The Washington Post and Comcast with Electro Secur (Chinese capital);
5) GTE-PCS, a unit of US-based GTE.

Licenses in region II (Gran Buenos Aires) were awarded to Union Transitoria de Empresas (a local consortium formed by Telefonica de Argentina subsidiary Unifon and Telecom Argentina), and US-based GTE. The 1900 license in region I and III (interior of the country) was given to Movicom (Compañía de Radiocomunicaciones Moviles). Due to the licenses, both GTE and Movicom will offer nationwide service due to their current cellular licenses.

1.3 Cellular Operator and Network Overview

1.3.1 Operator Overview

Movicom was the first cellular operator in Argentina, launching Band B service in Region II in November 1989. CTI, the Band B operator in Regions I and III followed suit much later, launching service in 1994. The Band A operators introduced competition in 1993 in Gran Buenos Aires and in 1996 for the rest of the country. Not all operators are offering digital service, but most are expanding and upgrading their systems.

1.3.2 Infrastructure Supplier Overview

Motorola and Ericsson supply the majority of the infrastructure in Argentina and most equipment is manufactured in Brazil as a result of low tariffs for industrial goods between the two Mercosur countries. In the past two years, Ericsson has supplied all the orders to Miniphone, Telecom Personal, Telefonica, and CTI

1.4 Cellular Operator Highlights

1.4.1 Movicom

Movicom was the first cellular operator in the Buenos Aires metropolitan area, launching service in November 1989. The company's parent CRM, also owns an Argentine paging operator, a Buenos Aires area trunking operator, and Uruguay's non-wireline cellular operator Abiatar. In 1992, Movicom introduced Motorola's N-AMPS technology to potentially triple the subscriber capacity of AMPS by employing digital signaling technology. The added capacity was crucial to Movicom since the central area of Buenos Aires is so densely populated. In June 1995, Movicom also became the first to begin trials of CDMA digital systems outside of the United States. Movicom launched a service in 1998 called Movistop, where subscribers receive a certain amount of minutes per month and prevents users from going over that amount.

1.4.2 Miniphone

Miniphone, the A band operator in Region II and jointly owned by Telecom and Telefónica, was granted the second cellular license and launched service in March 1993 with a US$42

million order from Ericsson consiting of 19 cell sites. By late 1993, the Miniphone network had 41 cells and 1,500 voice channels, providing coverage to the entire license area.

When Miniphone upgraded to digital technology in the first half of 1995, the TDMA portion of the Miniphone system supported a high volume of subscribers anticipated by Miniphone. The operator had problems in the deployment and commercialization of the service, including differences in frequency re-use planning and digital handset quality. In October 1995, Miniphone contracted Ericsson to upgrade the system to IS-136 to address these issues. By early 1996, however, Miniphone was no longer activating digital subscribers and did not resume promotion of the service until the second quarter 1997. Miniphone deployed a major expansion of the TDMA IS-136 system during second quarter 1998, and the majority of Miniphone subscribers are now on the digital network.

1.4.3 Telefónica Comunicaciones Personales (Unifon)

The Telefónica subsidiary, Telecomunicaciones Celulares Personales (TCP) operates under the trade name Unifon and launched service in March 1996. The operator invested US$250 million in the first 16 months of operation and currently covers 90 percent of the population in Region III with an Ericsson-supplied TDMA network. TCP invested US$190 million in 1997 and plans to increase total investment to US$280 million by 2001. Recent investments has created a total digital network with 23 switches and 470 base stations.

1.4.4 Telecom Personal

In May 1996, Compañía de Comunicaciones Personales del Interior (CCPI), the Telecom Argentina subsidiary, launched operations in the northern part of Argentina (Region I) under the brand name Personal. At launch, Personal was activating both digital and analog customers, allocating approximately 20 percent of its voice channels for TDMA IS-54b. The operator upgraded to IS-136 during 1997, investing more than US$100 million during that year to install 100 new sites and additional channel capacity.

1.4.5 Compania de Telefonos del Interior (CTI)

On January 31, 1994, the Compañía de Teléfonos del Interior (CTI) consortium was awarded a license to operate in both Region I and Region III of Argentina, and launched services the following September. CTI invested approximately US$500 million in infrastructure equipment to meet the coverage roll-out required by September. In the north the company operates under the CTI del Norte name and in the south under CTI Sur. The network was a 100 percent AMPS system, primarily supplied by Lucent and Plexsys before an upgrade by Ericsson to an AMPS/ TDMA system.

2. Chile

2.1 Telecommunications Regulation

2.1.1 Regulation

The Ministry of Transportation and Telecommunications (MTT) is the government authority that supervises and regulates all telecommunications services in Chile. The MTT is part of the Undersecretary for Telecommunications (*Subsecretaría de Telecomunicaciones,* or *Subtel*), whose primary functions include. In conjunction with the MTT, the National Planning Office (ODEPLAN) establishes overall telecommunications policy, including:

- issuing franchises, licenses and concessions for telecommunications equipment
- establishing technical standards for companies
- developing national and international telecommunications policy
- allocating radio frequency spectrum

Basic service pricing in Chile is regulated by Subtel and varies by geographic location. The monthly fee depends on the number of local telephone lines and the use fees are assessed on a peak and off peak time basis.

2.1.2 Legislation

Table 2.1 summarizes government legislation that has led to Chile's reputation as the most economically open country in Latin American.

Table 2.1 Chilean Regulatory Timeline, 1990 – 1998

1982	*Ley General de Telecomunicaciones* was passed, starting the process of telecom sector reform
1986	Telex Chile privatized
1989	Entel privitization
1992	Liberalized of Telecom Sector began
1994	Subtel completed the liberalization process and passed Law 3A, allowing full competition in the long distance market
1997	Chilean government issued three nationwide 1900 MHz licenses
Feb-99	Calling Party Pays implemented

In 1994, Chile opened long distance services to competition and as a result long distance prices were reduced by 80 percent. Demand for international calling grew by 80 percent in 1994, 30 percent in 1995 and 20 percent in 1996. Demand for domestic long distance increased 40 percent in 1994, 21 percent in 1995 and 20 percent in 1996 following deregulation.

Competition among five main telecommunications operators is driving growth in the market. These companies are: CTC, Entel, BellSouth de Chile, VTR and Telex Chile. The following table describes some key characteristics of these and other operators.

Wireline Services Market: 1998

Company	Services	Ownership	Comments
CTC	Basic telephony, long distance, data transmission, mobile systems, paging, SMR, Cable TV	Telefonica de Espana (43.6%)	Operates in all 13 Regions
Entel	Basic telephony, long distance, data transmission, mobile systems, PCS	Stet International (16%), Chilquinta (20%), Samsung, Various Chilean pension funds	
Telex-chile	Basic telephony, long distance, data transmission, mobile systems, PCS		
BellSouth	Long distance, mobile systems, Internet	BellSouth	
Manquehue	Basic telephony		South and around Santiago
CMET	Basic telephony		South and around Santiago
Transam	Long distance		
Iusatel	Long distance		
VTR	Basic telephony, long distance, data transmission, mobile systems	SBC (40%) Luksic (50.7%) Siemens (9.3%)	Local wireline company Telefónica del Sur operates in Regions X and XI

2.1.3 Telephony Infrastructure

Since privatization in 1989, the telecommunications sector has grown at an average annual rate of 14 percent. Chile's telecommunications network is one of the most advanced in Latin America, with nearly 2.6 million main lines as of September 1998, for a main line penetration of 17.8 for every 100 people. CTC accounts for an estimated 98 percent of telephone lines in service.

The unmet need for basic telephone services remains high in Chile. Most of the recent telephony infrastructure growth has been concentrated in urban centers. The northern and southern regions are characterized by low population density and the south has a difficult geographical terrain. This makes the development of the wireline infrastructure a difficult and expensive proposition. Telephone penetration rates vary by region due to the above mentioned factors. Metropolitan Santiago, Valparaiso, Magallanes, and Antofagasta have some of the highest telephone densities in the country.

2.2 Cellular Market Licensing Issues

The Chilean government has taken a relatively *laissez-faire* approach to the licensing of cellular in Chile. Cellular license areas in Chile are based on provincial boundaries which are designated by a roman numeral I-XII. In addition, one unnumbered region is designated for metropolitan Santiago. Table 4.4 describes the regional characteristics. There are very few restrictions placed on the 45-year license with respect to network construction and configuration.

2.2.1 800 MHz

In January 1988 the government initially announced that Entel and CTC would be the licensed cellular providers in the Metropolitan Region (Santiago) and Region V (Valparaiso). However, the licenses for the Metropolitan Region and Region V were granted to Cidcom in 1989 instead of Entel. Cidcom was a subsidiary of the U.S. AirTouch but was later purchased by BellSouth. CTC was awarded licenses for the Metropolitan Region, Region V, Region XI and Region XII. Licenses for Regions I-IV and VI-XII were granted to Telecom Chile. VTR Celular received permission to operate service in the same provinces as Telecom Chile.

Since the time that the licenses were initially issued, important changes have taken place. In September 1991, BellSouth acquired Cidcom and changed the name of the company to BellSouth. In March 1996, confronted with the prospect of competition from a national PCS licensee, VTR and CTC agreed to merge their mobile services companies into one operator. The new company, CTC-VTR Comunicaciones Moviles, operates under the brand name Startel. Finally, in October 1996, Entel acquired from Motorola a majority ownership in Telecom and changed the operator's name to Entel Telefonia Personal. Also, Entel acquired VTR's region XI and XII licenses to offer coverage in all provinces outside of region V and Santiago. In December 1997, CTC bought VTR's 45% stake in Startel for US$ 425 million, thus gaining 100% control of the company.

Cellular Licenses After Recent Consolidation: Chile

Operator Name	Owner	Share	Service Area	Service Launch
Startel	Compañía de Teléfonos de Chile (CTC)	100%	Nationwide	Mar 1989
BellSouth (Cidcom)	BellSouth	100%	Santiago, Region V	May 1989
Entel Telefonia Personal	Entel Chile Motorola	51% 49%	Regions I – IV and VI - XII	June 1991

Source: The Strategis Group

The process of consolidation in the market over the past few years has led to discontent among smaller competitors. The companies feel they can not compete unless they are able to join in partnerships with larger providers. Given that service bundling is one of the principal strategies employed by the larger market players, the concerns of the smaller players who are not able to bundle a variety of services are significant.

2.2.2 1800/ 1900 MHz Licensing

In December 1996, the Undersecretary of Telecommunications announced the winners of three nationwide 30 MHz PCS licenses in the 1850-1990 MHz band out of four proposals that were submitted. ENTEL PCS Telecomunicaciones, Entel Telefonia Movil, and Chilesat Telefonia Personal made the top three bids, which were based on a promise to launch service quickly and extent of coverage. CTC submitted a losing proposal.

2.3 Cellular Operator and Network Overview

2.3.1 Operator Overview

CTC Startel was the first operator in Chile, launching service in 1989. Cidcom (now BellSouth) followed shortly thereafter, and Entel launched in 1991. In 1998, Chilesat and Entel both launched 1800/1900 MHz service, further increasing competition (**Table 2.2**).

Table 2.2 Cellular Operator Summary: Chile

Operator	Primary Owner	Launch Date	Technology	Vendor	Regional Coverage
900 Mhz					
Startel	Compañía de Teléfonos de Chile (CTC)	Mar-89	AMPS	NEC, Motorola	Nationwide
Startel	Compañía de Teléfonos de Chile (CTC)	Jun-97	TDMA	Ericssson	
BellSouth	BellSouth	May-89	AMPS	Nortel	Santiago, Valparaiso
BellSouth	BellSouth	1995	TDMA	Nortel	
Entel Telefonia Personal	Entel Chile	Jun-91	AMPS	Motorola	Regions I – IV and VI - XII
1900 Mhz					
Chilesat Telefonía Personal	Telex-Chile/ Qualcomm	Sep-98	CDMA	Qualcomm	Nationwide
Entel PCS	Entel	Mar-98	GSM 1900	Ericsson	Nationwide
Entel Telefonía Movil	Entel	Mar-98	GSM 1900	Ericsson	Nationwide

2.3.2 Infrastructure Supplier Overview

NEC, Motorola and Nortel supplied Chile's infrastructure after privatization in 1989. Ericsson began to supply TDMA and GSM technology in 1997 and 1998 and Qualcomm supplied Chilesat with CDMA equipment after taking an equity share in the company. Chile is one of the few countries in Latin America to employ GSM technology as Entel decided to use the digital system for their 1900 MHz operators.

2.4 Cellular Operator Highlights

2.4.1 800 MHz

CTC Startel

Startel became the only nationwide cellular operator in Chile in 1996 when CTC Cellular merged with VTR Cellular, an operator that served regions of the country not serviced by CTC. CTC originally held 55&% of the shares and VTR had 45%, after purchasing 20% from CTC for approximately US$67 million. In December 1997, CTC bought VTR's 45% stake for US$425 million, thus gaining 100% control of the company.

When CTC and VTR merged, the new operator, Startel was working with two distinct cellular networks. CTC's network, supplied by NEC, consisted of one switch, 117 cells, and 2,253 voice channels in the center of the country, while VTR Celular, which shared its infrastructure with its competitor, Telecom, used Motorola switching and RF equipment.

To address the problems and prepare for digital competition, Startel launched digital service based on Ericsson's IS-136 TDMA wireless standard in June 1997. Digital service was first launched in Santiago and has been rolled out in interior markets. Startel invested US$97 million to upgrade its national network to digital and is migrating subscribers to the TDMA network. The operator accomplished its goal of a 10 percent digital subscriber base by the end of 1997. Startel offers digital service in the main cities of Chile, including Santaigao and Region V, La Serena, Concepción, and Puerto Montt.

BellSouth

BellSouth bought Cidcom in 1991 and became the second operator in the Santiago area when the operator launched TDMA service in 1995 with a system supplied by Nortel. By end of third quarter 1998, BellSouth had 164,000 subscribers and 43% of the market in its operational regions. In December 1998, Entel authorized its mobile subsidiary, Entel Telefonia Personal (ETP) to begin formal negotiations to sell one of its three mobile telephony licenses to BellSouth. Entel expects to receive US$140 million for the license, which would allow BellSouth to expand its operations to a nationwide level. BellSouth originally tried for Subtel or

the Antitrust Commission to withdraw one of Entel's license, however as this proved to be unsuccessful, BellSouth resorted to economic power.

Entel

Entel Telefonia Movil launched service in June 1991 under the name Telecom in regions I-IV and VI-XII. During 1996, Entel, the parent company, increased its minority position in Telecom Celular to 51 percent and changed the company's name to Entel. With the purchase of VTR Celular's system in Regions XI and XII for US$144 million in 1996, Entel operates in all areas of the country except Santiago and Valparaiso.

Network coverage has gradually reached 70 percent, including 27 cities and some rural areas in these regions. The system consists of seven switches, 31 cells, and 700 voice channels.

In the run up to the introduction of 1900 MHz service in December 1996, Entel raised the level of competition substantially. In the final quarter of 1996, Entel Telefonia Personal mounted an aggressive advertising campaign to thwart 1900 MHz growth and prepare the market for PCS. Advertising and courtesy booths were used to announce to the public that a superior digital service was coming and that it would be less expensive than PCS.

2.4.2 1900 MHz

Entel PCS & Entel Telefonía Movil

Entel PCS Telecomunicaciones, which was awarded the C block (1895-1910 paired with 1975-1990 MHz), will build 136 cell sites in all regions of the country and three switching centers in Santiago, Antofagasta, and Concepción. Entel PCS won based on speed to market and the company's proposal to complete its nationwide network build out within five months.

Entel Telefonia Movil was awarded the A block (1850-1865 paired with 1930-1945 MHz) by proposing to build out 167 cells, with installations in all 13 regions and four switching centers, one each in Antofagasta, Concepción, Punta Arenas, and Santiago. Entel launched GSM 1900 service in March 1998 for both A and C block systems after signing up 50,000 subscribers in the first two months of the year.

Chilesat Telefonia Personal

Chilesat Telefonia Peronsal (subsidiary of Telex-Chile) won the B block (1870-1885 paired with 1950-1965 MHz) by promising to build 148 cell sites nationwide, with one switching center in Santiago. In April 1997, faced with several financing hurdles, Chilesat opted to change its technology from its TDMA based bid to CDMA 1900 and took on Qualcomm as a 50 percent equity partner in April 1997. Qualcomm offered US$42 million and a financing agreement for US$94 million worth of Qualcomm CDMA infrastructure. The venture continues to look for a partner experienced in mobile service to join the venture. Chilesat Telefonia Personal plans to invest over US$300 million over five years. The operator breaks down its national network into

three regions: North (Region I- IV), Central (Santiago and V), and South (VI-XII). As of end of year 1998, Chilesat had not begun service in regions XI and XII. In December 1998 Subtel authorized Chilesat Telefonia Personal to extend its services nationwide, after allowing the installation of 13 base stations n northern and southern Chile. In the first quarter of fiscal year 1999, Chilesat PCS, launched service and added 17,000 subscribers in approximately two months.

3. Germany

3.1 Telecommunications Regulation

3.1.1 Regulation

Germany's dominant telecommunications operator is Deutsche Telekom AG, formerly known as the Deutsche Bundespost Telekom (DBP Telekom). In July 1989, the Ministry restructured the Deutsche Bundespost, dividing it into three independent enterprises called General Directorates: Postdienst, Telekom, and Postbank. Four years later in July 1993, DBP Telekom transferred all mobile activities to a wholly owned subsidiary, the Deutsche Telekom Mobilfunk GmbH (now known simply as T-Mobil). Legislation passed in 1994 re-launched Telekom as a joint stock company from January 1, 1995. Deutsche Telekom was partially privatized at the end of 1996, maintaining a large market share on most telecoms market segments.

The government then took its largest step toward setting the new regulatory and competitive framework for the German telecommunications industry in August 1996, through implementation of the new Telecommunications Act (TKG). The TKG allowed for the immediate and complete liberalization of the German telecommunications market, with the exception of basic telephone services, which was deregulated according to the European legislation on January 1st, 1998.

In addition to the liberalization of the telecommunications market-place in Germany on the 1st January 1998, a new telecommunications regulatory agency was established, The Regulatory Authority for Telecommunications and Posts (Reg TP). was created as a higher federal authority attached to the Federal Ministry of Economics. Its headquarters are in Bonn. The Regulatory Authority has taken over the functions of the former Federal Ministry of Posts and Telecommunications (BMPT) which was dissolved at the end of 1997. Moreover, the former Federal Office for Posts and Telecommunications (BAPT) has been integrated into the Regulatory Authority.

3.2 Cellular Market Overview

3.2.1 Overview

Germany's mobile telephony market has exhibited higher levels of performance since the introduction of GSM technology. The total number of subscribers surpassed 10 million by June 1998. By mid-1998, there were three cellular operators and four cellular systems in Germany: T-Mobil, Mannesmann Mobilfunk, and E-Plus. There are four cellular systems among the three operators.

3.2.2 Wireless Licensing and Regulation

Reg TP is the main regulatory body in the cellular industry, overseeing frequency allocation, assignment and usage, type approval, licensing, and radio frequency management and standardization, type testing and type approval of telecommunications equipment. The German regulator has indicated that it would adhere to European directives requiring the licensing of 3G services by 2002. However, the logistics of the licensing process have yet to be addressed.

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Table 3.1 Cellular Market Overview: Germany

Operator	System	Start-Up Date	Spectrum Allocation	Major Shareholders	Infrastructure Supplier	
					Switch	Base Stations
T-Mobil	NMT 450 (C-Netz)	May-86		Deutsche Telecom	Siemens	Siemens
T-Mobil	GSM 900 (D1)	Jul-92	2x12.4 MHz	Deutsche Telecom	Alcatel/Siemens/ DMCS 900	Alcatel/Motorola/ DMCS 900
Mannesmann	GSM 900 (D2)	Jun-92	2x12.4 MHz	Mannesmann AG, AirTouch	Ericsson/Siemens	Ericsson/Siemens
E-Plus	GSM 1800 (E1)	May-94	2x22.4 MHz	Thyssen AG, BellSouth, Vodafone, o.tel.o communications GmbH	Siemens/Nokia	Nokia
E2 Viag	GSM 1800	Early 1998	2x22.4 MHz	Viag, British Telecom, Telenor AS	n/a	n/a

Source: The Strategis Group

3.3 Operator Highlights

3.3.1 T-Mobil

DeTeMobil, known simply as T-Mobil since mid-1996, is a 100% subsidiary of Deutsche Telecom, The mobile branch of Deutsche Telecom operates two cellular networks: C-Netz and GSM.

3.3.2 C-Netz

T-Mobile operates an analogue C-Netz networks, which was commercially launched in May 1986. The analog system operates in the 450 MHz range and covers 98 percent of the population. Its 2,300 base stations are supplied by Siemens. The technology has now matured, and future investment in the network is expected to be minimal.

3.3.3 GSM 900

T-Mobil also operates a GSM 900 network, commercialized as D1, launched in July 1992, one full year after the initial planned launch date. As in the case of the Mannesmann Mobilfunk consortium (D2), the regulator provided T-Mobil with 7.2 MHz of spectrum. A combination of a an inadequate supply of GSM handsets, as well as technical difficulties with the system equipment produced delays in the launch date. Suppliers of network equipment include Motorola, Alcatel-SEL, DMCS 900 and Siemens.

By the end of 1996, D1 covered 98 percent of the German population with over 40 switches and 3,000 base stations. In July 1996, T-Mobil contracted with Lucent Technologies to extend its cellular network. The deal was worth $20 million. Similarly T-Mobil and Alcatel signed an expansion contract worth US$57 million for the period 1997 to 1998. T-Mobil estimated that total build-out costs would rise to DM 3.5 billion (US$2.5 billion) by 2000. D1 had already reached its break-even point in August 1994. Further contracts were awarded in September 1997 to Motorola for US$ 19 million and Lucent for US$60 million to extend coverage.

3.3.4 Mannesmann Mobilfunk

Competition in the cellular market was introduced with the licensing of Mannesmann Mobilfunk in December 1989. Commercial operation of D2 began two and a half years later in June 1992 with equipment supplied by Ericsson and Siemens. Mannesmann Mobilfunk is a German company owned by Mannesmann AG (65.2 percent), and AirTouch (34.8 percent).

By mid-1998, the D2 network covered 99 percent of the population with approximately 6,500 base-stations and 40 switches. Total investment to date is US$2.6

billion while total network deployment have been estimated at US$3 billion. Mannesmann reached its breakeven point in December 1993, and increased revenue from US$1.6 billion in 1995 to US$3.2 billion in 1997.

Ericsson and Mannesmann Mobilfunk signed contracts to continue the supply and further expansion of the D2 network. The US$ 165 million contract covers infrastructure supplies, base-stations, switching systems and microwave transmission. This contract, signed in February 1998, is the third to be awarded to Ericsson since the network was launched.

In June 1998, the operator also announced that it was testing a Wideband CDMA (W-CDMA) system. Testing will continue until the autumn of 1999 in Dusseldorf and at R&D centres in Nurembourg and Herzogenrath.

3.3.5 E-Plus

In May 1993, the German government granted a DCS 1800 license to E-Plus, a consortium which today consists of Thyssen AG (30.125 percent), o.tel.o communications GmbH (30.125 percent), BellSouth (22.507 percent) and Vodafone (17.243 percent). The GSM 1800 license terms prohibited the GSM operators from launching a GSM 1800 within four years of the award of the license.

The network was launched on May 27, 1994 and during its initial phase by the end of 1994 covered 40 percent of the population with 1,600 base stations, five switches supplied by Nokia and capacity for one million subscribers. By April 1997, E-Plus covered more than 90% of the German population (both East and West Germany as stipulated in the license) with 5,400 base-stations. By the beginning of 1998, investment reached a total of US$3 billion including 6,000 base stations and capacity of 10 million users. Total population coverage reached 98%. Additional equipment was supplied by Siemens.

3.3.6 E2 Mobilfunk

The Ministry of Posts and Telecommunications has awarded the second GSM-1800 network license to the only bidder, E2-Mobilfunk. E2 is owned by German industrial conglomerate Viag (45%), Telenor AS (10%) and by British Telecom (45%).

Viag commenced service rollout in mid 1997 and intends to launch what it terms a "Metropolitan Service" in 8 of the 10 major urban centers in October 1998 using 3,500 base-stations (50% population coverage). The metro areas are: Munich, Berlin, Nurembourg, Rhein-Main/Neckar, Leipzig/Halle, Hanover, Rhein-Ruhr and Hamburg/Luebeck.

Under the terms of the license, the E2 consortium is obligated to provide 75% population coverage by the end of 2001. E2 estimates as many as 11,000 base-stations will be required in order to meet their full deployment plans.

In order to enhance its national coverage capabilities, E2 has formed an 'national roaming' agreement with Swisscom of Switzerland. The agreement states that E2 is a 'service provider' of Swisscom. Therefore if a E2 customer makes a call when outside of the company's own coverage area, it is treated as call made by a roaming Swisscom customer. The call is carried by one of the three German cellular operators, under their roaming agreements with Swisscom. The agreement with Swisscom will last until the end of 2000, when E2's network should reach national coverage. Because of the significant roaming charges involved, E2 will price the service higher than calls connected on its own network. E2 felt it was necessary to sign the agreement with Swisscom because the three incumbent operators were not prepared to sign national roaming agreements.

Viag Interkom has awarded equipment contracts to two manufacturers. Siemens will install fixed line equipment, while Nokia will deploy the wireless infrastructure. The operator business strategy is to offer seamless fixed and mobile telecommunications access to business and consumers.

4. Mexico

4.1 Telecommunications Regulation

4.1.1 Regulation

Mexico's telecommunications industry is regulated by the Communications and Transport Ministry (*Secretaria de Comunicaciones y Transporte* – SCT). The SCT is responsible for granting concessions for telephone, radio, television and satellite frequencies.

Table 4.1 outlines in chronological order key decisions throughout the regulatory change process. In addition, Calling Party Pays was implemented in May, 1999.

Table 4.1 Regulatory Time Line: Mexican Telecommunications, 1989 – 1990

1989	Liberalization and privatization of the telecommunications sector
1989	Iusacell was licensed as a competing non-wireline (Band A) cellular operator in Region 9.
Mar-90	Mexican government issued eight additional non-wireline licenses from a selection of more than 100 applicants. The licenses are valid for 20 years and require 51 percent Mexican ownership.
Oct-90	*Forign investment and ownership encouraged. *Telmex, the state operator, was granted exclusive rights to domestic and international long-distance service for six years after privatization, while all other activities, including value-added services and cellular telephony, were opened to competition. *No monopoly conditions were ever imposed on the local telephony market in Mexico by regulatory authorities.
Late 1990: 20.4% stake in Telmex sold	* Consortium members: - Grupo Carso (10.4%) - France Cables et Radio, S.A. (5%) - Southwestern Bell International Holdings (10%)

Mexican Telecommunications, 1993- 1995

1993	Mexican government redefined its role in telecommunications with passage of new regulations *Secretariat of Communications & Transportation (SCT) was strengthened as a regulatory body while eliminating its role as an infrastructure builder and service provider in telecommunications *Continued privatization of Telmex *Telecomunicaciones de Mexico (Telecom) was created as a decentralized government agency to provide satellite and telegraph service *Government promoted foreign telecommunications investment by granting up to 49% ownership *Tariffs were liberalized on all telecommunication services with the exception of basic telephone rates.
May-94	The government sold 98 percent of its holdings through global offerings, with the controlling block sold to a consortium of Mexican and foreign investors.
May-95	Federal Telecommunications Law was enacted to deregulate the telecommunications industry and promote competition.
June 8, 1995: Federal Telecommunications Law was passed	*Licensing for satellite services was conducted through public auctions (an extension of the constitutional amendment passed January 1995, allowing private sector participation in satellite communications). *Auctioning of spectrum for wireless networks. Current licensees who own cable-based infrastructure permitted to commercially provide any telecommunications service (e.g. telephone). *Increase competition by requiring carriers to unbundle tariffs (which should be based on average long-term incremental costs). *Requires all public telecom networks to interconnect with each other. Interconnection agreements must be reached within 60 days of the dispute to be resolved by the SCT in no more than 60 additional days. *Non-dominant public carriers are free to set their tariffs while dominant carriers will have their tariffs regulated. *Cross-subsidies eliminated and rural subsidies to be funded by the government. *Allows companies to resell service.

Mexican Telecommunications, 1995- 1998

Novemeber 1995	COFETEL started to award domestic and international long distance licenses to alternative operators beginning with Avantel.
1996	COFETEL awarded 7 additional domestic and international long distance licenses.
August 1996: SCT regulatory duties handed to Federal Telecommunications Commission (Cofetel)	*Cofetel will act as autonomous administrative branch of the SCT to regulate and promote efficient development of telecommunications; facilitate administrative tasks relating to technical telecommunications plans Primary Functions Include: *Conduct telecommunications research *In conjunction with affiliated organizations, competing companies, academic and private institutions, promote the development of human resources specifically for telecom and technical development. *Make decisions regarding the granting, modification or revocation of concessions and telecommunications permits . *Administrate radio-electric spectrum, promoting its efficient use. *Maintain the official telecommunications register. *Promote and supervise efficient interconnection of equipment and public telecommunications networks, including foreign networks. *Register tariffs for telecommunications services.
Beginning of 1997	Mexican long distance telephony market was liberalized.
November 1997	PCS frequency auctions for mobile/fixed service commenced.
December, 1997	Telmex Tariff Rebalancing Completed
	*Local calls increased and long distance decreased.
	*Due to inflation, in real terms, the costs for services declined for local and long distance.
	*Line rental boosted by 70% while inflation fee fell.

Mexican Telecommunications, 1998- 1999

1998	COFETEL awarded 2 more domestic and international long distance licenses.
May 10, 1998	Cofetel announced the conclusion of the PCS auctions.
	*A total of 36 PCS licenses were issued good for 20 years- one for each of the following bands in each region: Band A (30 MHz); Band B (30 MHz); Band D (10 MHz); Band E (10 MHz).
October 1, 1998	Cofetel received US$437.61million, representing the final 80% payment for the recently awarded licenses, from six telecommunications companies: -Pegaso Comunicaciones y Sistemas (US$197.84 million) -Radiomovil, Dipsa, (Telcel) (US$115.59 million) -Iusacell PCS (US$44.83 million) -Servicios de Acceso Inalámbrico (Grupo Hermes) (US$1.83 million) -Telefonia Inalambrica del Norte (Telinor) (US$40.1 million) -Telefonos de Mexico (US$36.85 million) Cofetel granted 180-day extensions to: -Sistemas Profesionales de Comunicacion (US$238.2 million outstanding) -Midicel, S.A. de C.V. (US$92.48 million outstanding) *These companies will not be allowed to offer any telecommunications services until they meet the outstanding payments. *Bothcompanies had previously requested a postponement of the deadline claiming that international financial turmoil prevented them from raising the capital.
May 1, 1999	Calling Party Pays Implemented in Chile

Source: The Strategis Group

In 1995, the SCT awarded licenses for international and domestic long distance carriers to provide service beginning January 1, 1997 (**Table 4.2**). All of these companies are currently offering long distance service with the exception of Cableados y Sistemas.

AT&T is reportedly interested in selling up to 49% of its ownership in Alestra, and MCI has a desire to sell part of its share in Mexico's Avantel.

Table 4.2 Long Distance Licenses, Mexico

Operator	Commercial Name	Mexican Ownership	Foreign Ownership
Avance en Telecomunicaciones	Avantel	Banamex 55%	MCI 45%
Alestra	AT&T	Alfa 25.6%, Bancomer 25.4%	AT&T- 49%
Investcom	Protel	Comunicaciones San Luis	Nextel, Carlyle Group
Cableados y Sistemas	Bestel	Manuel Arroyo	n/a
IUSACell	Iusatel	Peralta Family	Bell Atlantic
Miditel	Miditel	n/a	Korea Telecom
Marcatel	Marcatel	Gustavo de la Garza	EXC Communications, Westel, Siemens
Telefonía Inalámbrica del Norte	Telnor	Tomas Milmo Santos, Lorenzo Zambrano, Antonio Santos	n/a
Teléfonos de México	Telmex	Carlos Slim Helu	France Telecom, Deutsche Telekom, SBC, Sprint

Source: The Strategis Group, based on company data

4.1.2 Telephony Infrastructure

One of the main reasons the Mexican government privatized Telmex was to develop the telephony infrastructure and to improve service. In 1989, prior to the privatization, there were approximately 4.8 million telephone lines in Mexico that had increased by an average of 200,000 per year. By September 1998, this number had increased to approximately 9.75 million (Table 12.1) for a penetration rate of 10.1 lines per 100 population, with 25.5% commercial lines.

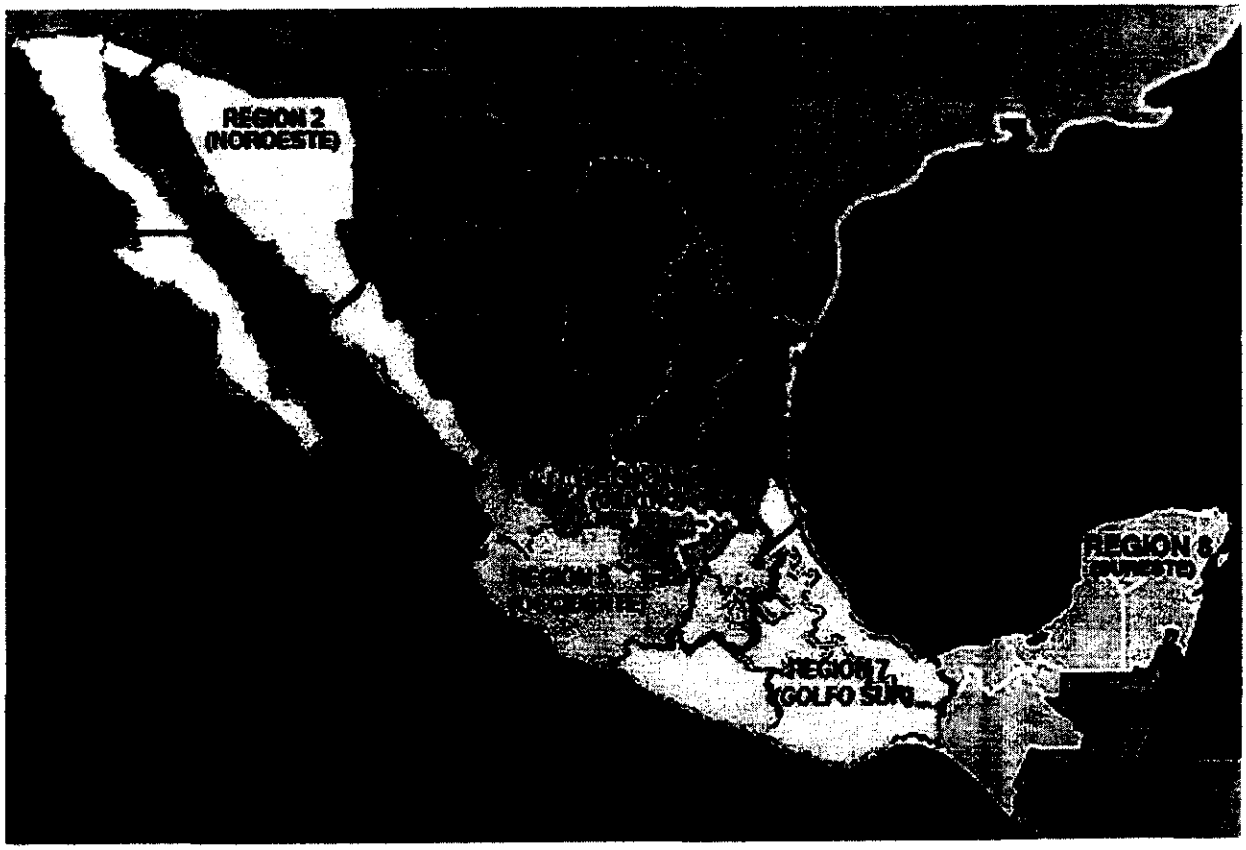
To improve the quality of the telephone network, Telmex has increased the percentage of digital lines from 29 percent in 1990 to an estimated 88 percent in 1998. Telmex is running at 92.6% of capacity. Currently, all communities with more than 500 inhabitants have access to telephone service, for a total of 20,544.

4.2 Cellular Market Licensing Issues

4.2.1 800 MHz Licensing

Mexico is currently divided into nine cellular regions with a wireline and a non-wireline operator in each market. The regions are: Baja (1), Noroeste (2), Norte (3),

Noreste (4), Occidente (5), Centro (6), Golfo y Sur (7), Sureste (8) and Ciudad de Mexico (9) (see map below). **Table 4.3** gives the owners for each operator in these 9 regions.



Source: Telmex

Table 4.3 Non-Wireline Ownership of Cellular Licenses in Mexico

Region	Operator	Ownership	Percent
1 - Baja	Baja Celular	E. and M. Vázquez Arroyo	48%
		Tecelmex	10%
		Motorola	42%
2 - Noroeste	Movitel	Baja Celular	78%
		AT&T Wireless Services Inc.	22%
3 - Norte	Cedetel	Cedetel	100%
4 - Noreste	Cedetel	Motorola	100%
5 - Occidente	Iusacell	Iusacell	100%
6 - Centro	Iusacell	Iusacell	100%
7 - Golfo y Sur	Iusacell	Iusacell	100%
8 - Sureste	Portatel	Luis Niño de Rivera	57%
		Associated Communications	24%
		LCC, Inc.	15%
		Various Mexican Investors	8%
9 - Ciudad de Mexico	Iusacell	Industrias Unidas	68%
		BellAtlantic Corporation	42%

Source: The Strategis Group, based on various trade press

4.2.2 1800/ 1900 MHz Licensing

After 127 rounds of biddings, the 1800- 1900 MHz frequency auctions were concluded on May 10, 1998. A total of 36 20 year licenses were issued, one for each of the following bands in each region: Band A (30 MHz); Band B (30 MHz); Band D (10 MHz); Band E (10 MHz).

- Cofetel used the same regional boundaries that define the cellular regions, but changed the regional number designation for the following regions:
    - PCS Region 5 is the same as cellular Region 8;
    - PCS Region 6 is the same as cellular Region 5;
    - PCS Region 7 is the same as cellular Region 6;
    - PCS Region 8 is the same as cellular Region 7.

The licenses are to be re-auctioned three years prior to the expiration of the license, for fixed or mobile wireless access in two separate bands according to the following scheme:

Spectrum	Total Bandwidth	Number of Licenses Per Region	Total Licenses
1850-1990 MHz	30 MHz	2	18
1850-1990 MHz	10 MHz	2	18
Total:			36

The results of the winners are in **Table 4.4.**

Table 4.4 PCS Cellular Licenses: Mexico

Region	A *(30 MHz)*	B *(30 MHZ)*	C *(10 MHz)*	D *(10 MHz)*
1	**SPC**	**QUALCOMM**	**DIPSA**	**GPO_IUSACELL**
value:	$16,235	$16,334	$15,316	$13,856
2	**SPC**	**QUALCOMM**	**DIPSA**	**MIDICELL**
value:	$2,971	$3,180	$1,508	$1,494
3	**SPC**	**Vacant**	**DIPSA**	**QUALCOMM**
value:	$10,216		$7,045	$7,035
4	**SPC**	**QUALCOMM**	**DIPSA**	**GPO_IUSACELL**
value:	$61,996	$59,143	$36,512	$35,703
5	**SPC**	**Vacant**	**DIPSA**	**QUALCOMM**
value:	$905		$683	$673
6	**SPC**	**QUALCOMM**	**DIPSA**	**MIDICELL**
value:	$29,112	$28,825	$9,010	$8,148
7	**SPC**	**MIDICELL**	**DIPSA**	**QUALCOMM**
value:	$7,123	$7,632	$8,321	$8,253
8	**SPC**	**GPO_HERMES**	**DIPSA**	**QUALCOMM**
value:	$2,050	$2,026	$633	$643
9	**SPC**	**QUALCOMM**	**DIPSA**	**MIDICELL**
value:	$89,696	$94,621	$48,753	$48,156

Source: The Strategis Group

4.3 Cellular Operator and Network Overview

4.3.1 Operator Overview

The cellular subsidiary of the state operator Telmex is Radiomovil Dipsa S.A. de C.V. and operates under the brand name Telcel. Telcel offers Band B cellular service is all nine regions. Most of the Band A (non-wireline) operators initiated cellular service in 1990, with Portacel (Region 6) and Iusacell (Region 7) beginning service in 1991. Non-wireline cellular operators cover the major cities and highways within their license areas. Operators in the northern part of the state cover over 85 percent of their populations while operators in the interior and southern areas of the country cover between 50 and 80 percent of the population.

During the first years of cellular service, Iusacell acquired other Band A operators. In 1993, Iusacell acquired 100 percent ownership of Portacel (Region 6) and Telcom (Region 7). Bell Atlantic bought into the company in the early 1990s and in 1996 assumed control of Iusacell's Board of Directors, despite owning a minority 42 percent stake in Iusacell.

In 1994, Motorola purchased a 42 percent equity stake in Baja Celular (Region 1) for US$100 million after Baja Celular had purchased Movitel (Region 2) earlier in the year. Motorola also consolidated its ownership of Cedetel (Region 4) with the Mexican Group Protexa. Cedetel, in turn, purchased Norcel (Region 3).

4.3.2 Infrastructure Supplier Overview

During 1997 and 1998, Ericsson, and Motorola supplied the vast majority of cellular infrastructure systems to operators in Mexico with Lucent, Nortel and Qualcomm signed one or two large contracts each. Ericsson supplied TDMA equipment, while Motorola, Lucent, Nortel and Qualcomm supplied CDMA infrastructure.

On September 4, 1997, Lucent began manufacturing cellular telephones and beepers in its Guadalajara Factory. Lucent arranged a joint venture with Philips to produce telephones in this plant. By 1999 all of its products produced in the Guadalajara plant will bear the Philips logo. Motorola also has a presence in Mexico and produces a wide variety of products out of its Chihuahua, Mexico plant.

4.4 Cellular Operator Highlights

4.4.1 800 MHz

Telcel

Telcel, the cellular subsidiary of Telmex, launched service in October 1989 in Region 1. Within three years, Telcel expanded service into the remaining eight regions in the country. Telmex voting control is jointly held by Grupo Carso (with 10.4 percent of the total paid in capital), SBC International (10%), and France Cables et Radio, S.A. (5%). Currently, Telcel covers nearly 60 percent of Mexico's population and is expanding in terms of coverage area and capacity. By the end of 1998, Telcel had 2.05 million subscribers.

On May 8, 1998 Telcel announced plans to invest U$300 million to install digital mobile technology, and subsequently ordered TDMA infrastructure orders later in the year. On November 16, 1998 Telcel awarded Telular Corp. a contract to supply fixed wireless terminals to the Rural Telephony Division of the operator Telcel.

Iusacell

Grupo Iusacell will carry out a US$80 million, four-stage, restructuring plan. Upon completion of various transactions, US-based Bell Atlantic and Mexican group Peralta will each own approximately 42% of Iusacel and Bell Atlantic will retain management control. Iusacell provides service in four of Mexico's nine regions (including Mexico City), representing 70% of the country's total population.

By the end of third quarter 1998, Iusacell's subscriber base was 661,562 customers, a 96% increase over third quarter 1997. Monthly contract churn for the period was 2.39%, compared with 3.03% in 1997. In March, 1998, Mexico's government signed a US$2 million deal with Iusacell to install a 5,000-unit mobile telephone network benefiting 1.5 million people in rural Mexico. The company received a government subsidy to offer service in rural areas. The operator had 661,562 at the end of third quarter 1998. Iusacell plans to invest US$160 million during 1999. US$100mn would go towards developing network infrastructure, while US$60mn would be spent on PCS technology.

Other Operators

- **Movitel** was the first cellular company in the northeast and now offers 75% coverage of the region.

- **Cedetel** started offering service in region 4 (Nuevo Leon, Tamaulips and part of Coahuila) in December 1990 and later purchased Norcel, the region 3 operator. In February 1998, Cedetel launched CDMA service, following a US$ 40 million

investment. The company plans to invest US$65 million in 1998 to extend service and continue modernization of its network. Cedetel currently has approximately 200,000 users.

4.4.2 1900 MHz

The recent winners of 1900 MHz licenses (**Table 4.4**), are currently builiding out networks and plan to roll out service in 1999.

Pegaso Telecomunicaciones joined with Qualcomm to form a consortium, Pegaso Comunicaciones y Sistemas (PCS), in the recent license bidding. Pegaso is 33%-owned by Leap Wireless International (the operators spin-off of Qualcomm). The remaining partners are: Grupo Pegaso, Grupo Televisa, Citicorp Equity Capital Latin America, AIG-GE Capital Latin America Infrastructure Fund, and Japan's Nissho Iwai Corporation. The company is building a nationwide network to provide CDMA service. The consortium launched commercial services in Mexico Mexico City and Tijuana and plans to launch in Monterrey and Guadalajara by end-year 1999.

SPC plans to invest US$1 billion over the next five years to provide service to 2 million mobile subscribers and 10 million wireless local loop subscribers within five years.

5. United Kingdom

5.1 Telecommunications Regulation

5.1.1 Regulation

As one of the most liberalized telecommunications markets in Europe, the fixed and wireless telecommunications market in the United Kingdom operates in a competitive environment for service provision as well as for a number of value-added service sectors. The Office of Telecommunications (OFTEL) is the independent regulatory body responsible for the monitoring and enforcing of telecommunications licenses of all fixed and wireless operators. OFTEL's goal is "*to provide the best possible deal for the customer in terms of quality, choice and value of money*", which, according to its philosophy, will be met by developing a fair competitive telecommunications environment. Tariffs are regulated by the Department of Trade and Industry (DTI).

The landmark White Paper, enacted in 1991, served as the catalyst for a more open environment by allowing fixed and wireless competition in the local loop, as well as equal access for interconnection with the two major fixed network operators: British Telecom (BT), which began its privatization in 1984, and Mercury Communications Ltd., a wholly owned subsidiary of Cable & Wireless Plc. BT, however, has maintained the lead in market share, largely due to Mercury's inability to compete following the launch of its service.

During 1997, Cable & Wireless merged with a number of cable operators, in an attempt to create an integrated telecoms company capable of competing with BT. The award of 44 international licenses will also shake up the market in time.

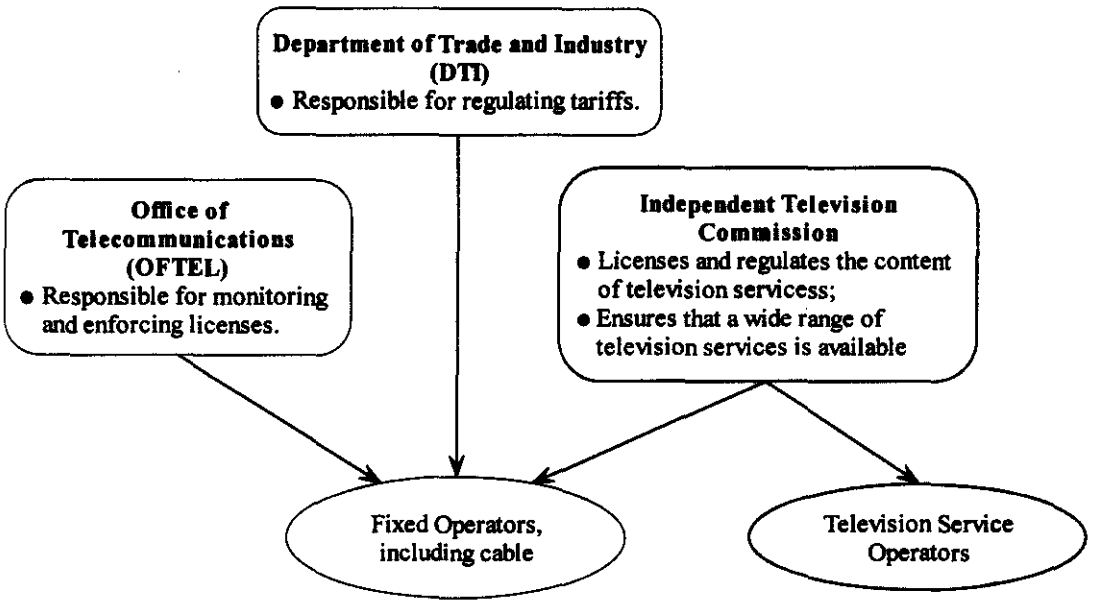
The White Paper's broad impact on the telecommunications market in the UK has lead to the entry of non-traditional players such as cable operators, who are slowly encroaching on BT's position and serve as potential rivals. Other competitors such as Metropolitan Fibre Systems (MFS) and City of London Telecommunications (Colt) provide local loop services through fiber optics, while the likes of Ionica and Atlantic Telecommunications compete via the wireless loop.

The buoyancy and openness of the UK telecommunications market has contributed to the advent of new players in the fields of international, national, regional, and local telecommunications. In the international resale service, Telia International (Sweden), Telstra (Australia), and AT&T have been granted licenses. In the long distance sector, Energis, owned by the UK's National Grid utility company, was the first entity to roll-out competitive service in September 1994. Privatized regional electricity companies have also been involved in providing telecommunications services. Torch Telecom, Norweb,

and Fibreway have been the most active in providing telecommunications services and announced operations in 1995.

Several licenses have also been awarded at the local loop level, and some, such as City of London Telecommunications (COLT), have opened service already. Other participants in this market include Metropolitan Fibre Systems (MFS), Ionica, and several regional cable companies.

Exhibit 1 Regulatory Authorities, United Kingdom, 1998



Source: The Strategis Group

5.2 Cellular Market Licensing Issues

5.2.1 Cellular Licensing

In the telecommunications sector, the Radiocommunications Agency (RA) is responsible for managing the radio frequency spectrum. UK regulatory agencies have also encouraged competitive licensing in all aspects of the mobile communications market including cellular, GSM 1800, CT-2, trunked radio, and mobile data. Up until 1997, the UK was the only European country to have two operational licensed GSM 1800 networks. Additionally, fixed wireless applications, such as Ionica's wireless local loop service, have also been licensed in the UK.

One-2-One and Orange have each been allocated 25 MHz of spectrum in the 1800 MHz range to provide GSM 1800 service. Vodafone and Cellnet each have 20.5 MHz in the 900 MHz range for cellular for both E-TACS and GSM 900. There is also an

additional 25 MHz originally allocated for a third GSM 1800 license which is being held by the Radiocommunications Agency. The government is currently considering whether to hold the spectrum in reserve, allocate it to the current GSM or GSM 1800 operators, or allocate the spectrum to other users.

The government introduced a White Paper that will impact wireless licensing in the UK. Radio licensing will change from the present flat-fee, administrative system to a market-driven regime, which will include spectrum auctions, and eventually the freedom for users to sell their unwanted spectrum privately. In the White Paper, possible licensing fees were outlined. In 1995/6 the license fee for a cellular or a PCS operator was approximately US$50,000. Under the new scheme the initial price for a cellular license would be £66,000, whereas a GSM 1800 license would cost £57,000. Thereafter, the license fee would be increased by £37,000 a year for a cellular license and £13,000 a year for a GSM 1800 license.

The DTI has published a draft Cordless Telecommunications Class License that, if implemented, will allow any potential operator to provide cordless telephony services to specific UK customers without having to follow formal license application procedures, or pay a license fee. This document would allow cordless telephony to become available to a far wider audience. Operators will be able to provide cordless services to companies that could not otherwise have afforded to operate their own system.

Furthermore, In March 1998 the Wireless telegraphy Bill was passed into law. The Bill is intended to allow more efficient use and management of the radio spectrum. The restructuring and new licensing procedures will be phased in over three years.

Table 5.1 Ownership of Cellular Licenses in United Kingdom

Operator	Network	Launch	Frequency	Ownership
One-2-One	GSM 1800	1993	2x30 MHz	MediaOne (50%), Cable & Wireless (50%)
Vodafone	ETACS	1985	2x8 MHz	Publicly Listed
Vodafone	GSM 900	1992	2x12.2 MHz 2x5.75 MHz	Publicly Listed
Orange	GSM 1800	1994	2x30 MHz	Hutchison Whampoa (48 %), BritishAerospace (21%), Listed (31%)
Cellnet	GSM 900	1994	2x12.2 MHz 2x5.75 MHz	BT (60%), Securicor (40%)
Cellnet	TACS	1995	2x8 MHz	BT (60%), Securicor (40%)

5.2.2 3G Licensing

The UK is the first European country announcing the commitment to award licenses and spectrum for 3G (UMTS) services. As of mid September 1998, there was still

uncertainty on the number of licenses to be awarded, with the UMTS consultative group recommending between four and five.

Existing cellular operators would be allowed to bid for the spectrum, but not licensed automatically. No firm decision has been made yet on the frequency band to be allocated for 3G services, though some recommendations have been made to free spectrum in the 2 GHz band. The Radiocommunications Agency is proposing to allocate each licensee 2x15 MHz of paired spectrum and 5 MHz of unpaired spectrum.

The UK government announced its intentions to license a number of 3G operators in early 1999. Technical trials would then start in 2000/1 with commercial deployment in 2002.

5.3 Cellular Operator and Network Overview

5.3.1 Overview

The UK market is one of the most competitive mobile communications industries in the world. Currently, four operators manage six systems: two analog and two GSM 900 network, and two GSM 1800 systems. Cellnet and Vodafone launched their analog networks in January 1985, also making the UK one of the longest running competitive markets in Europe. Since 1985, over US$2 billion has been invested to roll out the two analog networks. Both analog networks have registered declines in the number of subscribers since early 1996. These networks are in the process of being phased out of the UK cellular market.

GSM 900 was first introduced by Vodafone at the end of 1991 in the London area. Due to technical problems and a shortage of equipment, the service never achieved the expected penetration and was relaunched twice, in September 1993 and in the third quarter of 1994. Cellnet introduced its GSM service in the last quarter of 1994.

One-2-One launched its GSM 1800 service on September 7, 1993 with 700 base stations, making it the first GSM 1800 network in the world. The second GSM 1800 operator, Orange, commenced operations in April 1994.

In July 1996, the DTI awarded additional approximately 10 MHz of spectrum to all four current operators. One-2-One and Orange received 10 MHz each in the 1800 MHz band. Cellnet and Vodafone were awarded 2x11.5 MHz in the 1800 MHz, to support GSM 900/1800 dual band and/or special fixed wireless operations. DTI has yet to allow the GSM 900 operators to commence dual mode operations. The cellular operators will be required to bear the costs of clearing the spectrum. The two analog networks are to be phased out by 2005, gradually being replaced by new 900MHz GSM spectrum. The DTI has indicated that it will carry out a review in 2000 to determine other possible services

that may make use of spectrum released by the closure of the TACS network in 2005. The DTI also indicated that future licenses will be offered via competitive tender to existing players and new entrants.

5.4 Cellular Operator Highlights

5.4.1 Cellnet

Cellnet, whose owners include BT (60 percent) and Securicor (40 percent), operates one E-TACS and one GSM 900 network. Base stations and switches for the E-TACS network were supplied by Motorola. At the end of 1997, the analog network covered 98 percent of the population with over 23 EMX switches and 1,116 base-stations. Cellnet spent over US$1 billion in rolling out the network. In 1997, it has stopped investing in the network concentrating its resources to improve coverage and quality of the GSM network.

5.4.2 GSM 900

Cellnet commercially launched its GSM 900 service on September 1, 1994 with an initial coverage of 95 percent of the population (8 watts) and 1,000 base stations. Cellnet's GSM 900 network was supplied by Siemens and Motorola for switches, and Nokia and Motorola for base stations. The network had an estimated capacity of five million users. In May 1997, Cellnet announced its biggest increase in capacity and coverage. The expansion is part of Cellnet's US$1.6 billion investment program which involves spending US$1.6 million daily until 2000. Nokia has won the expansion project. By mid of 1998, the operator had over 2,800 base stations and 21 switches. An additional 1,7000 GSM 1800 base stations will be installed to provide coverage in high density areas and inside buildings.

5.4.3 Vodafone

Vodafone's original owners Racal Telecom (85 percent) and Millicom (15 percent) brought the company public in the late eighties to raise capital to meet the anticipated construction costs for the build out of two nationwide cellular networks. Since that time, the owners have gradually sold off their stakes in the company, so that by the end of 1994 ownership of Vodafone was completely distributed in the London Stock Exchange.

The Vodafone Group generates an increasing percentage of its revenues from a number of ownership stakes in various international cellular networks.

5.4.3.1 TACS

Vodafone's analog TACS 900 network was supplied by Ericsson and commenced operations on January 1, 1985. The 26 switches and 830 base stations cover 98 percent of the population and support handheld, transportable, and car phones. In line with corporate strategy, Vodafone is halting all investments in the US$900 million analog network and channeling capital to its GSM 900 network.

5.4.3.2 GSM 900

GSM 900 service was initiated in central London on December 2, 1991, making it the first GSM network in the world. However, a shortage of terminals and inadequate marketing limited expansion. The service was relaunched in September 1993 under the names of EuroDigital and MetroDigital. The second launch achieved modest awareness and the service was for a third time launched in the summer of 1994. At the end of 1994, the GSM 900 network covered 98 percent of the population (8 Watts) with 1,600 base stations. The switches were supplied by Ericsson and the base stations by Ericsson and Nokia. Vodafone has signed up Ericsson to supply infrastructure over the next three years worth US$ 331.2 million. With the deployment of this additional infrastructure, Vodafone currently offers 96.51 (2 Watts) percent population coverage, 70.13 percent of the territory with approximately 4,000 base stations and 16 switches.

Vodafone has teamed up with Racal Telecom for a new fixed/wireline network for businesses in early 1998. The system will use the Vodafone's recently awarded GSM 1800 spectrum. Business customers will be able to log onto a private GSM 1800 network while indoors and access the GSM 900 network while on the road.

In February 1998, Vodafone and Qualcomm concluded a GSM-CDMA network trial. The trial was designed to demonstrate the ability to overlay IS-95 radio access to a GSM mobile switching centre without requiring major changes to existing CDMA or GSM products. In June of 1998, the operator was the first European cellular company to announce technical trials of the compatibility between W-CDMA and GSM technologies. The trials will be conducted on a small Vodafone owned site.

5.4.4 One-2-One

One-2-One, a joint venture between Cable & Wireless and MediaOne Group, initiated operations of a GSM 1800 network in September 1993. The system is supplied by Ericsson and Nortel and covered 80 percent of the population at the end of 1996. The operator underperformed during 1996, owing to poor coverage relative to that of the competition. Significant investments were made in 1997 and early 1998 to expand to nationwide coverage and 97 percent of the population with over 3,000 base stations for total network investments of over US$1.6 billions.

5.4.5 Orange

Orange, initially owned by Hutchison Telecom (65 percent), British Aerospace (30 percent), and Barclays (5 percent), operates a GSM-1800 network which began operations in April 1994. In March, 1996, joint owners of Orange, Hutchinson Whampoa and British Aerospace, formed a new company, Orange plc, which became the holding company for the Hutchinson Telecommunications (UK) Group. A minority stake of 25% was sold through a global offering.

The network, which is supplied by Nokia and Nortel, initiated service with 50 percent population coverage. By the end of June 1998, the network consisted of over 4,000 base sites for a 96% population coverage and a 75 percent geographic coverage, and eventually Orange hopes to increase the network to over 6,000 base sites by the end of 1999 and 10,000 by 2001, reaching 99 percent of the population and improving signal strength for in-building and on-the-move coverage.

The Strategis Group Corporate Overview

The Strategis Group (formerly MTA-EMCI) is a 70 person full-service consulting firm recognized as a world leader in the telecom industry. The Strategis Group serves a diverse international client base including service providers, manufacturers, financial institutions, entrepreneurs, governments, and litigants in the competitive telephony, wireless, multi-channel video, and Internet industries. The Strategis Group provides a full range of consulting services including:

- business and strategic planning
- economic and financial analysis
- demand forecasting and analysis
- competitive and market share analysis
- due diligence and valuations
- partnering and acquisition assistance
- primary market research
- technology assessment

The Strategis Group conducts extensive primary research concerning service providers, manufacturers and end users in order to track the continuous evolution of telecommunications. Our affiliation with industry operators, manufacturers, trade associations, and other industry players allows access to a wide array of resources.

In addition to proprietary consulting services, The Strategis Group publishes an extensive series of industry reports for the competitive telephony, wireless, Internet, and multi-channel video industries. These publications are a cost effective means for companies to research general areas within specific industries and many have become standard industry guidebooks to benchmarks and expected development.

The Strategis Group is the result of a merger between Malarkey Taylor Associates (MTA) and Economic and Management Consultants International (EMCI). Since 1966, MTA has been recognized as the world's leading cable TV and fiber telephony consulting firm. EMCI, founded in 1987, is widely recognized as one of the premier consulting and market research firms serving the wireless and competitive telephony industries. As The Strategis Group, this combination draws on extensive expertise to address the increasing convergence of cable TV, wireline telephony, and wireless technology. With divisions dedicated to financial analysis, technology assessment, consumer research, international markets, and industry development, The Strategis Group is unsurpassed in providing our clients a clear view of the communications industry.

The Strategis Group is based in Washington, DC and maintains international offices in London and Singapore.

About the Authors

Michael Krier, Director for Latin America, is responsible for managing the regional activities of the company and analyzing developments in the market place. He has experience analyzing a wide variety of telecommunications technologies -- including cellular/PCS, paging/messaging, data/Internet, pay TV, mobile satellite, wireline, long distance and wireless local loop -- in markets around the world. With language skills in Spanish and Portuguese, Mr. Krier has been involved in several consulting projects for multinational firms with activities in Latin America as well as for companies based in the region. He has also presented speeches on international telecommunications markets at various conferences in the U.S., Asia and Latin America. Mr. Krier received his B.A. degree in Economics and International Relations from American University and is currently pursuing his M.B.A. at Virginia Tech University.

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